BIOPAC Systems, Inc.

42 Aero Camino, Goleta, CA 93117
Phone (805) 685-0066 Fax (805) 685-0067
www.biopac.com ~ info@biopac.com

Dissolved O_2 Probe Transducer — RXPROBE-02A

The dissolved oxygen probe can be used to measure the concentration of dissolved oxygen in water samples tested in the field or in the laboratory. Use this sensor to perform a wide variety of tests or experiments to determine changes in dissolved oxygen levels, one of the primary indicators of the quality of an aquatic environment:

- Monitor dissolved oxygen in an aquarium containing different combinations of plant and animal species.
- Measure changes in dissolved oxygen concentration resulting from photosynthesis and respiration in aquatic plants.
- Use this sensor for an accurate on-site test of dissolved oxygen concentration in a stream or lake survey, in order to evaluate the capability of the water to support different types of plant and animal life.
- Measure Biological Oxygen Demand (B.O.D.) in water samples containing organic matter that consumes oxygen as it decays.
- Determine the relationship between dissolved oxygen concentration and temperature of a water sample.

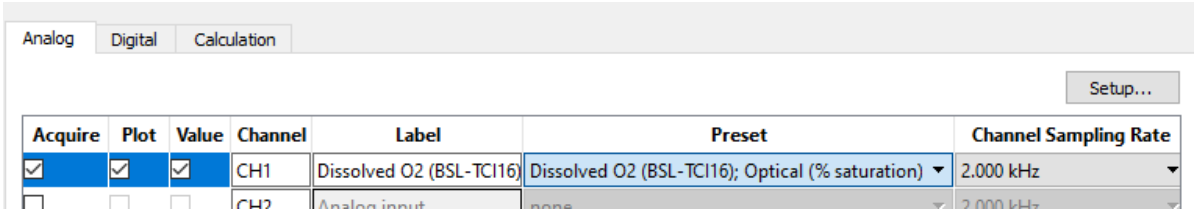
Components — Dissolved O_2 Probe, Probe Storage Bottle, Light Shield

Interface — Use with BIOPAC BSL-TCI16 Transducer Connector to record with a BIOPAC MP36, MP36R, MP35, MP46, or MP45 data acquisition unit.

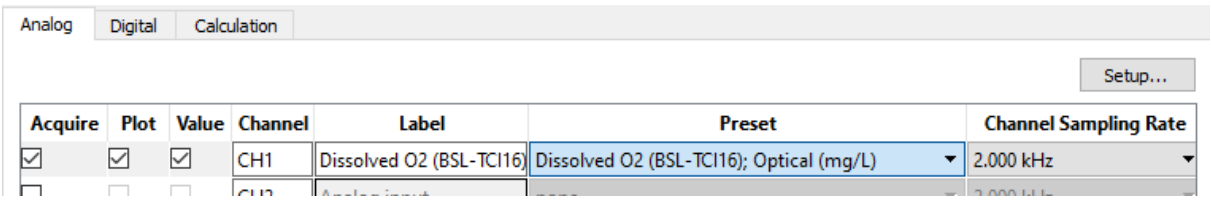
Usage — The probe is ready to use right out of the bottle but should be rinsed with distilled water before and after use. Also, it can be reset/calibrated if desired. A switch on the probe's cable box allows the output to be scaled in % saturation or mg/L.

Setup

1. Insert the BT connector on the RXPROBE-02A into the BSL-TCI16 transducer connector.
2. Connect the BSL-TCI16 transducer connector to an MP36, MP36R, MP35, MP46, or MP45 data unit.
3. On the probe's cable box, select the output to be proportional to O_2 saturation (%) or O_2 concentration (mg/L).
4. In BIOPAC software, select MP menu (e.g., MP36) > Set Up Data Acquisition… and select the appropriate preset from the dropdown menu for the channel the probe is connected to (at step 1b). The preset should match the choice made at step 1c.



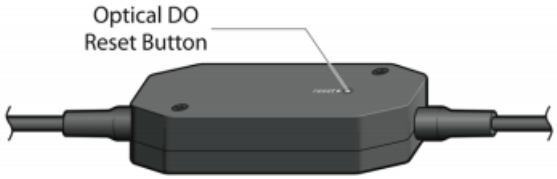
or



Calibration—*optional*

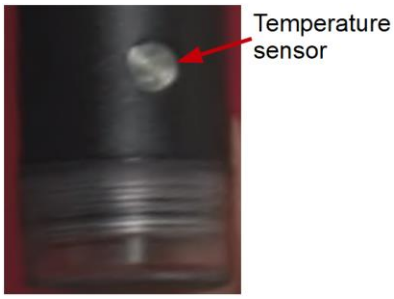
- Calibration is rarely necessary, but if desired, perform the following steps.

1. On the probe's cable box, set the switch to "%". The switch may be configured for mg/L after calibration, and the probe will be calibrated for that setting when this procedure is completed. However, during calibration it should be in "%" mode.
2. Similarly, to properly observe the process, the software should be configured to report values in units of %, so if necessary, change the preset to % saturation (step d, above).
3. Fill the storage bottle with distilled water ***up to the level of the top of the sponge***.
4. Insert the probe tip into the bottle but ***not*** far enough to be in contact with the water/sponge at the bottom of the bottle.
5. Hold the probe in this position for at least one minute.
6. In the graph window set up as described in steps a-d above, click the "Start" button to begin recording data.
7. Using a straightened paper clip or other object with similar size and stiffness, press down the reset button located within the cable box, and hold the button down for three seconds:



8. Release the button and watch the data collected in the graph window. The value should drop to around 0.
9. Continue to watch the graph window as the probe's output increases. The value should reach around 100%. This may take only 30 seconds or it may take several minutes.
10. Once the reading stabilizes, wait an additional 30 seconds.
    - **This additional waiting period is important** as it is during this time that the probe writes new calibration information onto the SD card inside the cable box.
11. Remove the probe from the storage bottle. It is now calibrated.

Acquiring Data



The probe should be rinsed with distilled water and blotted dry with a paper towel before being placed into the solution to be measured. The probe has a temperature sensor which must be submerged in the solution for the probe to provide properly calibrated values.

The probe and cable are water resistant, but the cable box is not. The cable box should never be submerged. The probe's body may be entirely submerged down to one meter for up to 30 minutes. If the probe's seal is damaged, water may enter the case and damage the probe. Take care not to harm the seal around the probe. An optional protector may be purchased to guard the probe and weigh it down, allowing it to be suspended by the cable. Contact BIOPAC for details.

The temperature sensor is operational between 0 and 50º C, but more time should be allowed for measurements to stabilize if the temperature is below 15º C or above 30º C. Measurements typically require 30 seconds to a minute to stabilize at temperatures between these values.

The cable box includes a barometric pressure sensor that compensates for changes in altitude at which measurements are made.

The probe uses fluorescence to detect oxygen, and readings may be impaired by ambient lighting, particularly full spectrum fluorescent lighting. The included light shield should be used to block such light from reaching the probe's sensor.

The probe is designed for aqueous solutions only. It should never be used in organic solutions such as oils, alcohols, glycols, ketones, or non-polar solvents such as pentane or hexane.

Salinity will affect the measurement. If the probe is used in water with a salt concentration greater than 1 g/L (note, sea water's saline concentration is roughly 35 g/L), readings from the probe should be adjusted. The adjustment depends on temperature. Data obtained without compensation may be corrected after acquisition as long as the water temperature and salinity level of the sample were recorded at the time the measurements were made. For more detail, contact BIOPAC for support.

Care of Probe

When measurements are completed, rinse the probe with distilled water and blot dry with a paper towel. The sponge in the storage bottle should be dampened with distilled water, and the probe tip may be replaced in the bottle.

Store the probe away from direct sunlight to prevent damage to the cap on the probe tip. The probe tip has a two-year warranty but should last longer if it is cared for properly. If performance begins to degrade, the probe cap may be replaced without replacing the entire probe. Order RXPROBE-02A-CAP for replacement.

Probe may be disinfected by swirling probe body (do NOT disassemble the probe) in a 1:10 dilution of household bleach. Rinse thoroughly with distilled water after disinfecting.

Principle of Operation

The cap of the probe is coated with a luminous substance. Within the probe, an LED flashes onto the cap short wavelength light (which appears blue to a human observer) causing molecules of this substance to enter an excited state. In this state, the molecules may transfer energy to oxygen molecules. As a result of this transfer, the photons emitted by the molecules returning to the ground state have longer wavelength than the light used to excite them. A photodiode with a filter preferentially passing this long wavelength light records the signal coming back from the cap.

At higher oxygen concentrations, collisions between oxygen molecules and the excited luminophores occur more quickly due to statistical thermodynamics. The probe measures the time elapsed between the LED flashes and the return of light from luminophores that have encountered oxygen molecules. Higher oxygen concentrations result in shorter elapsed times, allowing oxygen concentration to be derived.

Specifications

Parameter	Mode	Values
Range	mg/L	0 – 20 mg/L
Range	%	0 – 300%
Accuracy	mg/L	±0.2 mg/L below 10 mg/L; ±0.4 mg/L above 10 mg/L
Accuracy	%	±2% below 100%; ±5% above 100%
Accuracy with calibration reset	mg/L	±0.1 mg/L below 10 mg/L; ±0.2 mg/L above 10 mg/L
Accuracy with calibration reset	%	±1% below 100%; ±5% above 100%
Type	both	Luminescent
Response time	both	90% of final reading in 40 seconds (@ 15º -30º C)
Temperature compensation	both	Automatic from 0 to 50º C
Pressure compensation	both	Automatic from 228 mm Hg to 1519 mm Hg
Salinity compensation	both	Manual (in software)
Minimum sample flow	both	none
Scaling values (software)	mg/L	0 mV -> -0.4444 mg/L; 10 mV -> 4 mg/L
Scaling values (software)	%	0 mV -> -6.6666%; 10 mV -> 60%